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09/784,952	02/16/2001	Toshinori Ono	29287/117	4195

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EXAMINER

UHLIR, NIKOLAS J

ART UNIT

PAPER NUMBER

1773

7

DATE MAILED: 06/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

A 37

**Office Action Summary**

Application No.

09/784,952

Applicant(s)

ONO ET AL.

Examiner

Nikolas J. Uhler

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 April 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2 and 8-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) none is/are allowed.
- 6) ☒ Claim(s) 1,2 and 8-11 is/are rejected.
- 7) ☐ Claim(s) 9 and 10 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. This office action is in response to the amendment/arguments filed 4/4/03. The applicants amendment to require a diamond like carbon film that contains at least a functional group having N atoms renders the prior applied 103 rejection of the claims untenable. Accordingly, the prior 103 rejection is withdrawn. Further applicants amendments are sufficient to overcome the prior applied 112 rejections. Accordingly these rejections are withdrawn. However, the case is not in condition for allowance in light of the newly applied prior art, as is discussed below.

#### ***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 1-2, and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokosawa et al. (US6001479) in view of Ruhe et al., further in view of Hayashi (US5637373).
4. Claim 1 requires a magnetic recording medium having a magnetic film on a non-magnetic substrate by intercalating at least an underlayer, the proportion of functional groups per 100 carbons atoms in a diamond like carbon protective coating mainly composed of carbon for protecting the magnetic film exceeds 20% and includes at least a functional group having N atoms.
5. For the purpose of this examination, the examiner has interpreted the limitation "proportion of functional groups per 100 carbons atoms... exceeds 20% and includes at least a functional group having N atoms" as not requiring all of the functional groups to

contain N atoms, as "includes at least a function group having N atoms" merely requires one or more functional groups having N atoms to be present, and does not limit all of the functional groups that are present to N containing functional groups. Accordingly, a diamond like carbon film having >20 functional groups/100 carbon atoms, wherein 1 function group includes an N atom reads on the limitations of claim 1.

6. With respect to the limitations of claim 1, With respect to the limitations of claim 1, Yokosawa et al. teaches a magnetic recording medium comprising a non-magnetic substrate, a magnetic layer (equivalent to applicants claimed magnetic film on a non-magnetic substrate by intercalating at least an underlayer), a protective layer, and a lubricating layer (column 3, lines 40-50). The protective layer is formed of diamond like carbon (DLC), and the lubricating layer comprises a perfluoropolyether lubricant having a polar terminal group and a hydrocarbon lubricant (column 5, lines 30-67 and column 8, example 2). Further, Yokosawa et al. teaches that the terminal groups on the perfluoropolyether lubricant and the functional groups on the DLC surface affect how the lubricant is adhered. Certain terminal groups on the lubricant will chemically adsorb functional groups on such as COOH (carboxyl group) or OH (hydroxyl group) on the DLC surface, whereas certain terminal groups on the lubricant will not chemically adsorb these functional groups, thus resulting in the lubricant being physically adsorbed onto the surface (column 10, lines 1-13).

7. Yokosawa et al. does not teach a DLC film that has a proportion of functional groups per 100-carbon atoms that is greater than 20%, wherein the DLC film includes at least a functional group having N atoms, as required by claim 1.

8. However, with respect to the requirement of greater than 20% functional groups per 100 carbon atoms, Ruhe et al. teaches that the surface chemistry of a solid surface such as the surface of diamond like carbon impacts the attachment mechanisms of a lubricant film, specifically lubricants such as perfluoropolyethers (p 828, left column 1st paragraph, and page 829, right column 1st paragraph). In particular, Ruhe et al. teaches that lubricant films that are attached to surfaces that have a large number of surface reactive groups, such as a DLC coating having large numbers of -COOH, CO and C-OH groups on its surface contain more chemisorbed polymer, whereas films which are attached to surfaces with few surface reactive groups (such as cleaved graphite) are more physisorbed (p 828, right column table, p 833, right column 1st paragraph, p 834, left column paragraph 2). Chemisorbed films are more strongly adhered to the substrate surface than physisorbed films, and are not easily removed from the substrate (page 835, conclusion). Ruhe teaches that the amount of functional groups on the surface of the carbon film can be controlled by carefully controlling the parameters of the sputtering process utilized to form the DLC film (page 828, right column). Thus, the examiner takes the position that the number of functional groups on the surface of a diamond like carbon film that is coated with a perfluoropolyether lubricant is a results effective variable.

9. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to change the number and type of functional groups on the surface of the DLC film taught by Yokosawa et al., in order to optimize the adhesion of a specific lubricant to the surface of the DLC film.

10. One would have been motivated to change the number of functional groups on the surface of the DLC film taught by Yokosawa et al. due to the teaching in Ruhe et al. that adhesion of a perfluoropolyether lubricant to the surface of a DLC film is increased when the DLC film contains a large number of functional groups, due to the increased likelihood that the lubricant will be chemisorbed onto the surface of the DLC film. One would have been motivated to change the functional groups on the surface of the DLC film taught by Yokosawa et al. due to the teaching in Yokosawa et al. that the terminal groups of perfluoropolyethers will only chemically adsorb certain functional groups on the surface of a DLC film, and the teaching in Ruhe et al. that perfluoropolyethers which are chemically adsorbed (chemisorbed) are more strongly adhered to the surface of a DLC film than those which are physically adsorbed (Physisorbed). One would expect greater longevity of a lubricant which is more strongly adhered to a surface than one which is physically adsorbed.

11. However, Yokosawa as modified by Ruhe does not teach a DLC film including a functional group having an N atom, as required by claim 1.

12. With respect to this deficiency, Hayashi et al. teaches the addition of group IV elements such as N into a DLC protective film in order to reduce the internal stress of the DLC film and increase its adhesion to a substrate. Hayashi et al. teaches the addition of nitrogen to the DLC film by incorporating a reactive gas such as ammonia into the deposition chamber when the DLC film is being processed (column 5, lines 45+). It is the examiners position that such a process will result in the formation of N containing functional groups in a DLC coating.

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13. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add nitrogen as taught by Hayashi to the DLC carbon film taught by Yokosawa as modified by Ruhe.

14. One would have been motivated to make this modification due to the teaching in Hayashi that incorporating N into a DLC protective film increases the adhesion of the protective film to its substrate.

15. Claim 2 requires a lubricating film of a perfluoroether having at least one functional group to be provided on the surface of the protective film. This limitation is met as set forth above for claim 1.

16. The limitations of claims 9 and 10 are identical to that of claims 1 and 2 respectively. Thus, these limitations are met as set forth above for claims 1 and 2.

17. Claims 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokosawa as modified by Ruhe and Hayashi as applied to claims 2 and 10 above, and further in view of Hosoe et al. (US5759681).

18. Yokosawa as modified by Ruhe and Hayashi as set forth above for claims 2 and 10 does not teach an magnetic recording apparatus having a driving part for a magnetic recording medium, a magnetic head having a recording part and a reproducing part, and a recovery-reproducing signal processing part for giving and receiving signals to the magnetic head, and a magnetoresistive head as the reproducing part of the magnetic head, as required by claims 8 and 11.

19. However, Hosoe et al. teaches a well known magnetic recording system for a multilayer magnetic medium, wherein the recording system comprises a drive section

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(equivalent to applicants driving part), a magnetic head having separate read/write sections (equivalent to applicants claimed magnetic head having a recording part and a reproducing part), wherein the reproducing part is magneto resistive, and read/write signal processing means (equivalent to applicants claimed signal processing part for sending and receiving signals to the magnetic head) (column 10, lines 40-65).

20. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the magnetic recording apparatus taught by Hosoe et al. with the magnetic recording medium taught by Yokosawa as modified by Ruhe and Hayashi.

21. One would have been motivated to do so due to the teaching in Hosoe that a magnetic recording apparatus having the required structure of claims 8 and 11 are well known as suitable for use with multilayer magnetic recording media (such as the media taught by Yokosawa et al. as modified by Ruhe et al.).

### ***Double Patenting***

22. Claims 9 and 10 are objected to under 37 CFR 1.75 as being a substantial duplicate of claims 1 and 2. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

### ***Response to Arguments***

23. Applicant's arguments with respect to claims 1-2 and 8-11 have been considered but are moot in view of the new ground(s) of rejection.



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***Examiners Not***


24. The examiner notes that copies of the Yokosawa, Ruhe, Hayashi, and Hosoe patents accompanied the prior office action, and so are not included with this office action.

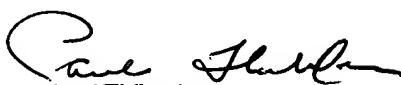
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhler whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

  
nju  
June 2, 2003

  
Paul Thibodeau  
Supervisory Patent Examiner  
Technology Center 1700